

Having sighted a very young one some 3 feet in length sitting on a log in the water, I approached quietly to see how near I could get before he slid in. The log was opposite a shelving part of the otherwise steep bank where I had some weeks before seen a mugger sunning itself.

While the shelving part was still obscured from view by the grassy top of the bank, I heard what I imagined to be a water buffalo or bullock lowing, as they very often do, while coming out of water after drinking. The lowing bellows were repeated two or three times in quick succession, and my first reaction was to discard further caution in approach and to continue on up the river.

As I started however I caught sight through the grass of a massive crocodile, his mouth wide open waddling up the bank out of the water. Close to him was another 7-footer already lying in the sun.

I slipped back to where the orderly was standing, took the rifle and returned *à la cobra* to the top of the bank. The two muggers were lying side by side, neither was moving and baby was watching from the log. I did not wait to see whether the big one's bellow was an invitation to waltz or a request to the smaller one to move on, but put a bullet into his neck immediately.

The bullet appeared to have broken the neck thus preventing all motive power from the brain reaching the body. The latter was in fact dead though the head was certainly alive. He taped 12 feet 4 inches, girth 5 feet 3 inches, and took twelve men and boys to lift. His belly contained three pieces of a silver ornament and some broken iron fish hooks. This particular saurian was reported to have pulled in a full grown buffalo in December and was not itself seen again for some days afterwards.

It would be interesting to know the significance of the bellowing at 3.30 p. m. in the afternoon and whether a similar instance has been previously recorded.

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II.—THE ZONAL DISTRIBUTION OF THE MOLE CRAB (*EMERITA ASIATICA*) ON THE MADRAS COAST.

The Anomuran decapod, *Emerita asiatica*, is one of the most abundantly represented species in the inter-tidal zone of the Madras Coast.¹ The species is of common occurrence at various places along

¹ *Emerita asiatica* occurs in large numbers along the Malabar Coast, particularly at Cochin and Cranganore; but here besides the typical specimens a variety of rather stunted or dwarfish individuals also occurs. This variety is easily distinguished from the *forma typica* by the peculiar pigmentation on the dorsal aspect of the cephalothorax. While it is of a uniform colour in the typical specimens, the cephalothorax in variety bears a distinct pattern—on a brown background, a longitudinal median white streak which is less conspicuous

the Indian Coast and at Madras they are found in large numbers, throughout the year. Larger specimens of this mole crab are daily caught in hundreds by the fisherfolk who use them for food.

It is well known that on the sea bottom animals group themselves into what are called 'communities'; certain species of animals living together in a particular locality, on a particular substratum, to form a community. On the sandy beach this sort of distribution results in what is termed 'zonation of species', the zone occupied by a particular species or a group of species being in direct relation to its distance from the high tide level, and the nature of the substratum. On the Madras Coast, *Emerita asiatica* not only illustrates this phenomenon clearly but also shows the preference for particular kinds of substrata at various stages of its growth.

Emerita asiatica breeds almost throughout the year, with a period of maximum intensity from January to April. During November and December, i.e. the north-east monsoon period, the majority of specimens are soft-skinned, having undergone moult, and have the ovaries fully developed, while some of them are berried, carrying eggs attached to the pleopods. By the end of December most of the specimens are berried and from January onwards the larvae begin to appear in large numbers in the plankton. By the end of February these larvae begin to metamorphose and the early post-larval or pre-adolescent stages settle down on the sandy beach. Some idea of the number of young ones produced during each season can be obtained from the fact that a sample of sand, a quarter of a square metre in area, and about three inches in depth, taken from the particular zone, sometime in March, often yields young *Emerita*—of size varying from 3 to 5 mm.—sufficient to fill a one-pound kilner jar.

The distribution of *Emerita* in the inter-tidal zone is peculiar. The smallest specimens, which teem literally in thousands, are found very near high water level, restricted to a narrow zone, about two yards in width, along the entire Coast. The substratum here is formed of fine sand which is somewhat loosened by the numerous specimens that burrow in it. At low water level the substratum is coarse grained and the largest specimens measuring about 2 to 2½ inches, are found in this region. Between these two zones specimens of intermediate sizes are found; larger ones nearer low water level and smaller ones nearer high water level. There is thus a distinct zonation in this species, both with reference to size as well as to substratum; the smallest specimens being commonest in fine sand near high water mark, and the largest in coarse sand near low water mark. The specimens, especially smaller ones, are often dislodged from the sand and carried away by the incessant waves, to some extent resulting in the mixing up of individuals of different sizes. It is, however, remarkable that while some of the smaller specimens

anteriorly where it is connected by curved white lines to two white spots on either side, and then ending in a pale spot. It is interesting to observe that the size at maturity in these dwarfish individuals is relatively small, berried females measuring only about 10 mm. being quite common. In the typical form, however, sexual maturity in the female is attained only when the specimen grows to about an inch or more in length. It is peculiar that the two forms occur side by side in the same substratum.

are carried towards the low water level, larger ones are rarely found near high water mark.

The distribution of a species on a sandy beach will be influenced by various factors such as the nature of the substratum, time of exposure, availability of food, etc. In the case of *Emerita* the young specimens prefer a substratum of fine sand, and the larger ones, a coarse substratum. This preference is probably explained by the fact that the larger particles of the coarse substratum, constantly rubbing against each other forcibly by wave action, often prove fatal to the small individuals, while the larger specimens, capable of withstanding the churning effect of the coarse particles, can easily burrow into the loose substratum.

Emerita derives its food from the minute organisms that are drawn into the current of water set in by the antennules—a phenomenon that can be easily observed if a couple of active specimens are placed in a glass dish containing some sand and sea water. Along the sandy beach they burrow themselves facing the sea, and with each incoming wave prop up their heads, the antennules are held in position and the current is set up. When the wave recedes they burrow into the sand again, so that the chances for procuring food directly depend upon the length of time they are submerged under water. The substratum at low water level being submerged during most of the time the larger specimens have greater chance of procuring food, whereas near high water mark the period of exposure, is long, the area being submerged only for a short time, during high tides. During the major portion of the day this zone is exposed to the direct heat of the sun resulting in considerable dessication due to evaporation. One can imagine the severe struggle for existence that is going on in this over-populated area, when during the very short time they are covered by water, they busily try to secure their day's rations!

The above observations were made while I was carrying on an investigation of the fauna of the sandy beach, Madras, under Prof. R. Gopala Aiyar, Director, University Zoology Laboratory, Madras, to whom I am deeply indebted for the valuable help he extended to me.

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[A note with illustrations of both sexes of *E. asiatica* appeared in Volume xxxvii, p. 699 of the *Journal*.—Eds.]